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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/618,227

07/11/2003

Jung-Lin Pan

I-2-0456.1US

4405

24374 7590 03/02/2009

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EXAMINER

PATHAK, SUDHANSHU C

ART UNIT

PAPER NUMBER

2611

MAIL DATE

DELIVERY MODE

03/02/2009

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/618,227	Applicant(s) PAN ET AL.	
	Examiner SUDHANSHU C. PATHAK	Art Unit 2611	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 21 November 2008.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 3-5, 8-10, 13-15, 18-22, 25 and 31-33 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 3-5, 8-10, 13-15 and 18-20 is/are allowed.
- 6) ☒ Claim(s) 21, 25 and 31-33 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 11 July 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--------------------------------------------------------------------------------------|-------------------------------------------------------------------|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. Claims 3-5, 8-10, 13-15, 18-22, 25 & 31-33 are pending in the application.
2. Claims 1-2, 6-7, 11-12, 16-17, 23-24 & 26-30 have been canceled.

Response to Arguments

3. Applicant's arguments filed in amendment dated 11/21/2008 have been fully considered but they are not persuasive.

In regards to the specific argument "In contrast, Applicants disclose performing a circular convolution on the result of an FFT (see claim 21). First, a circular convolution is not the same as a convolution", this is clearly incorrect. Reading Claim 21 (line 4) it is clear that the circular convolution is performed on the time domain signals " m " and " h " and not on the result of an FFT. Furthermore, in regards to another argument "Additionally, performing a circular convolution on the result of an FFT is not disclosed by Sklar. For these reasons, the Applicants submit that claim 21 is allowable over Sklar", this is clearly incorrect (See above response).

In regards to the specific argument "First, a circular convolution is not the same as a convolution. "A convolution is a mathematical operation on two functions f and g , producing a third function that is typically viewed as a modified version of one of the original functions," (<http://en.wikipedia.org/wiki/Convolution>). "A circular convolution of two functions is defined in terms of the periodic extension of one or both functions. Periodic extension means a new function is formed by shifting the original function by multiples of some period, T , and adding all the copies together" (http://en.wikipedia.org/wiki/Circular_convolution)", this is incorrect. Reading the

wikipedia links (as recited in the arguments) regarding "convolution" and "circular convolution", wherein it clearly shows that a convolution operation becomes a circular convolution if any one of the functions is periodic. Furthermore, it would have been obvious to one of ordinary skill in the art at the time of the invention that a received signal (as is recited in the claim) is digitized (ADC) before performing the convolution operation or FFT thus the ADC introduces periodicity (based on the sampling frequency) there the received signal "r" is periodic and therefore the convolution performed is circular.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 21-22 & 31-33 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sklar (Digital Communications; Chapter 1, Section 1.6, Pages 30-33; Copyright 1988).

In regards to Claims 21-22, Sklar discloses a method for performing a channel impulse response comprising receiving a time domain signal (Fig. 1.9, element $y(t)$) wherein the received signal is a circular convolution (Page 31, Eq. 1.46) of the transmitted signal (Fig. 1.9 & Eq. 1.46, element $x(t)$) and the channel impulse response (Fig. 1.9 & Eq. 1.46, element $h(t)$). Sklar further discloses presenting the received signal in the frequency domain (Fig. 1.9 & Eq. 1.48, elements $X(f)$, $H(f)$,

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$Y(f)$) by performing fourier transform (Page 31, Section 1.6.2). Sklar further discloses computing the channel impulse response in the frequency domain by dividing the received signal (Eq. 1.49, element $Y(f)$) with the transmitted signal (Eq. 1.49, element $X(f)$). However, Sklar does not explicitly disclose performing a circular convolution. However, it would have been obvious to one of ordinary skill in the art at the time of the invention that a received signal (as is recited in the claim) is digitized (ADC) before performing the convolution operation or FFT thus the ADC introduces periodicity (based on the sampling frequency) there the received signal "r" is periodic and therefore the convolution performed is circular. Furthermore, Sklar does not explicitly discloses performing an inverse fourier transform to estimate the impulse response and further performing a (inverse) fast fourier transform (FFT) / (IFFT) to go from time domain to frequency domain and further does not explicitly disclose a midamble. However, it would have been obvious to one of ordinary skill in the art at the time of the invention that FFT/IFFT performs frequency domain and time domain computations and further a convolution in time domain is a multiplying in the frequency domain. Furthermore, it would have been obvious to one of ordinary skill in the art at the time of the invention that it is common to transmit a midamble (training sequence) to determine the channel estimation. Furthermore, it is inherent in FFT and IFFT to be exchangeable as recited in claim 22.

In regards to Claim 31-33, Furthermore, it would have been obvious to one of ordinary skill in the art a the time of the invention to implement channel estimation in

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a receiver and further a wireless transceiver in a base station so as to be able to reliably receive the transmitted data.

6. Claims 25 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sklar (Digital Communications; Chapter 1, Section 1.6, Pages 30-33; Copyright 1988) in view of Eidson (2004/0047284).

In regards to Claim 25, Sklar discloses a method for performing a channel impulse response as described above. However, Sklar does not disclose the FFT is extended to a proper length.

Eidson discloses a wireless communications receiver (Fig. 11). Eidson further discloses receiving a reference signal of variable length (Paragraphs 122-124). Eidson further discloses extending the FFT to a desired length "L" for more efficient computation (Paragraph 125). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention that Eidson teaches extending the FFT to a desired length "L" for more efficient computation and this is implemented in the system as described in the AAPA so as to be able to vary the pilot (training) sequence depending on the channel conditions and the desires accuracy of the channel estimate.

Allowable Subject Matter

7. Claims 3-5, 8-10, 13-15 & 18-20 are allowable over the Prior Art of Record.

Conclusion

8. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

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A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to SUDHANSHU C. PATHAK whose telephone number is (571)272-5509. The examiner can normally be reached on 9am-5pm. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Chieh M. Fan can be reached on 571-272-3042.

The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Sudhanshu C Pathak/
Primary Examiner, Art Unit 2611